



NOAA SCIENTIFIC PUBLICATIONS REPORT APRIL 14, 2014

HIGHLIGHTED ARTICLES

[Nuclear and mitochondrial patterns of population structure in North Pacific false killer whales \(*Pseudorca crassidens*\)](#)

[A modeled comparison of direct and food web-mediated impacts of common pesticides on Pacific salmon](#)

[Exploration of geographic variation of persistent organic pollutants in Hawaiian monk seals \(*Monachus schauinslandi*\) in the main Hawaiian Islands](#)





NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

ADDITIONAL ARTICLES

[Surgical tagging and telemetry methods in fisheries research: promoting veterinary and research collaboration](#)

[Toward enhanced MIQE compliance: reference residual normalization of qPCR gene expression data](#)

[Cohort resonance: a significant component of fluctuations in recruitment, egg production and catch of fished populations](#)

[Machine learning approaches to investigate the impact of pcbs on the transcriptome of the common bottlenose dolphin \(*Tursiops truncatus*\)](#)

[Recommendations for photo-identification methods used in capture-recapture models with cetaceans](#)

[Spatio-temporal associations of albacore CPUE in the Northeastern Pacific with localized and climate environmental indices](#)

[Mysterious bio-duck sound attributed to the Antarctic minke whale \(*Balaenoptera bonaerensis*\)](#)

[Hedonic pricing of Atlantic Cod: effects of size, freshness, and gear](#)

[Dynamics of larval fish assemblages in the California Current System: a comparative study between Oregon and southern California](#)



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT APRIL 14, 2014

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

[Progress and challenges in biogeochemical modeling of the Pacific Arctic region](#)

[Abrupt climate changes and emerging ice-ocean processes in the Pacific Arctic Region](#)

[United Nations Scientific Committee on the Effects of Atomic Radiation UNSCEAR 2013 Report to the General Assembly, with scientific annexes Volume I: Report to the General Assembly, Scientific Annex A](#)



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT APRIL 14, 2014

HIGHLIGHTED ARTICLES

Nuclear and mitochondrial patterns of population structure in North Pacific false killer whales (*Pseudorca crassidens*)

Journal of Heredity

K.K. Martien (NMFS/SWFSC), **S.J. Chivers** (NMFS/SWFSC), R.W. Baird, **F.I. Archer** (NMFS/SWFSC), **A.M. Gorgone** (NMFS/SEFSC), **B.L. Hancock-Hanser** (NMFS/SWFSC), D. Mattila, D.J. McSweeney, **E.M. Oleson** (NMFS/PIFSC), C. Palmer, **V.L. Pease** (NMFS/SWFSC), **K.M. Robertson** (NMFS/SWFSC), G.S. Schorr, M.B. Schultz, D.L. Webster, and **B.L. Taylor** (NMFS/SWFSC)

- The results of this genetic differentiation study support the current stock delineation for false killer whales in the Hawaiian Islands.
- The findings are consistent with previous photo-identification, satellite tagging, and genetic studies that demonstrated the ecological and genetic uniqueness of main Hawaiian Islands false killer whales.
- The island-associated false killer whale populations likely share a common colonization history, but have limited contemporary gene flow.

False killer whales (*Pseudorca crassidens*) are large Delphinids typically found in deep water far offshore. However, in the Hawaiian Archipelago there are two resident island-associated populations of false killer whales: one in the waters around the main Hawaiian Islands (MHI) and one in the waters around the Northwestern Hawaiian Islands (NWHI). The Authors used mitochondrial DNA (mtDNA) control region sequences and genotypes from 16 nuclear (nucDNA) microsatellite loci from 206 individuals to examine levels of differentiation among the two island-associated populations and offshore animals from the central and eastern North Pacific. Both mtDNA and nucDNA exhibited highly significant differentiation between populations, confirming limited gene flow in both sexes. The mtDNA haplotypes exhibited a strong pattern of phylogeographic concordance, with



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

island-associated populations sharing three closely related haplotypes not found elsewhere in the Pacific. However, nucDNA data suggests that NWHI animals are at least as differentiated from MHI animals as they are from offshore animals. The patterns of differentiation revealed by the two marker types suggest that the island-associated false killer whale populations likely share a common colonization history, but have limited contemporary gene flow.

Expected Publication Date: 30 April 2014

A modeled comparison of direct and food web-mediated impacts of common pesticides on Pacific salmon

PLoS ONE

K. H. Macneale, J. A. Spromberg, D. H. Baldwin, and N. L. Scholz (NMFS/NWFSC)

- Pesticide toxicity to aquatic food webs can, under certain circumstances, have more significant impacts on juvenile salmon growth and survival than directly toxic effects to salmon health.
- This study reinforces the importance of clean water to support biological resiliency in critical habitats for ESA-listed species.
- Considering both indirect and direct effects allows a better understanding of potential impacts of a chemical stressor on an endangered species and prey recovery rates.

In the western United States, pesticides used in agricultural and urban areas are often detected in streams and rivers that support threatened and endangered Pacific salmon. Although concentrations are rarely high enough to cause direct salmon mortality, they can reach levels sufficient to impair juvenile feeding behavior and limit invertebrate prey abundance. This raises the possibility of direct adverse effects on juvenile salmon health and indirect effects on salmon growth as a consequence of reduced prey abundance. The





NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

authors modeled the growth of ocean-type Chinook salmon (*Oncorhynchus tshawytscha*) at the individual and population scales, investigating insecticides that differ in how long they impair salmon feeding behavior and in how toxic they are to salmon compared to invertebrates. The relative importance of these direct vs. indirect effects depends both on how quickly salmon can recover and on the relative toxicity of an insecticide to salmon and their prey. Model simulations indicate that when exposed to a long-acting organophosphate insecticide that is highly toxic to salmon and invertebrates (e.g., chlorpyrifos), the long-lasting effect on salmon feeding behavior drives the reduction in salmon population growth with reductions in prey abundance having little additional impact. When exposed to short-acting carbamate insecticides at concentrations that salmon recover from quickly but are lethal to invertebrates (e.g., carbaryl), the impacts on salmon populations are due primarily to reductions in their prey. For pesticides like carbaryl, prey sensitivity and how quickly the prey community can recover are particularly important in determining the magnitude of impact on their predators.

Published: 31 March 2014

*Exploration of geographic variation of persistent organic pollutants in Hawaiian monk seals (*Monachus schauinslandi*) in the main Hawaiian Islands*

Endangered Species Research

J. Lopez (NMFS/PIFSC), K. D. Hyrenbach, C. Littnan (NMFS/PIFSC), and G. M. Ylitalo (NMFS/NWFSC)

- This information can help to identify Hawaiian monk seals most at risk for POP contamination and their associated effects, based on their typical geographic home range.
- Patterns were identified at the island scale, rather than the finer watershed scale.

Geographic variation in the levels of persistent organic pollutants (POPs) was assessed in





NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

the plasma serum of Hawaiian monk seals from the main Hawaiian Islands. Twenty seals were outfitted with tracking devices to map their home ranges, which were then compared with the POP levels in their serum. Seals with similar ranges were shown to have similar POP levels, and seals with home ranges around the island of O‘ahu had significantly higher summed polychlorinated biphenyls and polybrominated diphenyl ethers than seals around the islands of Kaua‘i and Moloka‘i. This difference was not seen for summed diphenyl-dichlorotriphenylethanes or chlordanes. Statistical non-metric multi-dimensional scaling (NMS) was used to determine if this geographic variation in serum POP levels was associated with specific POPs, watersheds, or state land use districts. There were differences in the land use characteristics adjacent to seals’ home ranges between two islands: seals with home ranges around O‘ahu had a high percentage of area adjacent to urban land use districts, and seals with home ranges around Moloka‘i had a high percentage of area adjacent to rural and agricultural land use districts. Integration of serum POP levels and seal home ranges revealed geographic patterns that will help assess the risk of POPs to individual seals. The integrated approach highlighted in this study is applicable to other marine wildlife exposed to local and non-point pollutants.

Accepted: 13 March 2014





NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

ADDITIONAL ARTICLES

Surgical tagging and telemetry methods in fisheries research: promoting veterinary and research collaboration

American Journal of Veterinary Research

M. W. Rub, N. Jepsen, T. L. Liedtke, **M. L. Moser**, and E. P. Scott Weber, III
(NMFS/NWFSC)

- The intent of this paper is to increase surgical tagging expertise of veterinarians and fish researchers.
- We describe common protocols in four aspects of the process used to surgically implant transmitters in fish: handling, aseptic technique, anesthesia, and implantation; and the effects of surgical tagging that have been documented to date.
- We identify aspects of the surgical implant process where collaboration and professional exchange amongst researchers and veterinarians may be most fruitful.

Surgical experience is important to ensure a successful outcome for fish telemetry. A past survey of researchers actively using surgery for fish telemetry deployment indicated that they learned transmitter implantation techniques primarily from a combination of observation, various literature sources, and mentors; few learned techniques from veterinarians. Seventy-eight percent of those surveyed reported they had little to no practice (i.e., performed surgery on only 0-10 individuals) before participating in their first telemetry study. Responses from this survey indicated substantial room for improvement in the teaching and development of surgical protocols for implantation of telemetry transmitters, particularly from a veterinary perspective. Here we provide information about how veterinary principles can be incorporated into fish surgical implantation procedures and insight into the unique challenges of aquatic field based surgical studies. We describe common protocols in four aspects of the process used to surgically implant transmitters in fish: handling, aseptic technique, anesthesia, and implantation; and the effects of surgical





NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

tagging that have been documented to date. We also identify aspects of the surgical implant process where collaboration and professional exchange amongst researchers and veterinarians may be most fruitful.

Expected Publication Date: April 2014

Toward enhanced MIQE compliance: reference residual normalization of qPCR gene expression data

Journal of Biomolecular Techniques

R. C. Edmunds, J. K. McIntyre, A. A. Luckenbach, D. H. Baldwin, and J. P. Incardona (NMFS/NWFSC)

- Provides an improvement to conventional qPCR normalization methodology that enhances mathematical transparency, statistical rigor, and compliance with Minimum Information for Quantitative Experiments (MIQE) guidelines for publication.

Normalization of fluorescence-based quantitative real-time PCR (qPCR) data varies across quantitative gene expression studies, despite its integral role in accurate data quantification and interpretation. Identification of suitable reference genes plays an essential role in accurate qPCR normalization, as it ensures that uncorrected gene expression data reflect normalized data. The reference residual normalization (RRN) method presented here is a modified approach to conventional qPCR normalization that increases mathematical transparency and incorporates statistical assessment of reference gene stability. RRN improves mathematical transparency through the use of sample-specific RRs that are generated from the mean Ct of one or more unaffected (i.e., stable) reference gene(s). To determine stability of putative reference genes, RRN uses ANOVA to assess the effect of treatment on expression and subsequent equivalence-threshold testing to establish the minimum permitted resolution. Step-by-step instructions and comprehensive examples that



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

demonstrate the influence of reference gene stability on target gene normalization and interpretation are provided. Through mathematical transparency and statistical rigor, RRN promotes compliance with Minimum Information for Quantitative Experiments and in so doing, provides increased confidence in qPCR data analysis and interpretation.
Expected Publication Date: April 2014

Cohort resonance: a significant component of fluctuations in recruitment, egg production and catch of fished populations

ICES Journal of Marine Science

L. Botsford, M. Holland, **J. Field** (NMFS/SWFSC) and A. Hastings

- The authors define the term *cohort resonance* to describe a characteristic behavior of age structured populations, wherein changes in the abundance of adults can lead to fluctuations in fished populations
- The authors discuss how cohort residence can be used to determine sensitivity to various frequencies in the environmental signal influencing a population
- Better understanding cohort residence aids in predicting how changes in the frequency content of the physical environment caused by climate change will affect fished populations

Hjort (1914) identified two important aspects of the early life of fish as being important determinants of fluctuations in year class strength: changes in nutrition and transport. He dismissed a third possible influence, changes in the abundance of the reproductive stock. Here we describe how a recently discovered characteristic behavior of age structured populations termed *cohort resonance*, which does involve changes in adult abundance, can have a substantial effect on fluctuations in fished populations. Cohort resonance involves selectively greater sensitivity of age-structured populations to generational frequencies and to very low frequencies in the environmental signal influencing a population. This frequency-dependent selectivity has been shown to increase with fishing, as do the total



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

amounts of variability in recruitment, egg production and catch. Cohort resonance differs from other recent model mechanisms proposed to explain the observed increase in variability with fishing in that it does not require over-compensatory density dependence. It stems from the compensatory ascending limb of the egg-recruit relationship, and is a characteristic of a stable population driven by a random environment. We demonstrate the differences in frequency selectivity and increases in variability with fishing among three different Pacific coast species with different longevity: coho salmon (*Oncorhynchus kisutch*) (~3y), Pacific hake (*Merluccius productus*) (~25y) and Pacific Ocean perch (*Sebastes alutus*) (~90y). The shortest lived, coho salmon is the most sensitive to environmental variability, but variability in egg production and catch both increase more rapidly with fishing in the longer-lived species. Understanding cohort resonance will aid in anticipation of predicted potential changes in the frequency content of the physical environment with changing climate (e.g., more frequent El Niños), and it provides a warning regarding the possible confounding of increasing sensitivity to slow change due to fishing with actual slow change of population parameters due to climate change. Our understanding of the role of cohort resonance in population variability will be enhanced by further identification of empirical examples. We describe some of the challenges in this effort.

Expected Publication Date: Summer 2014

Machine learning approaches to investigate the impact of pcbs on the transcriptome of the common bottlenose dolphin (Tursiops truncatus)

Marine Environmental Research

A. Mancia, J.C. Ryan, **F.M. Van Dolah (NOS)**, J.R. Kucklick, **T.K. Rowles (NMFS/OPR)**, R.S. Wells, **P.E. Rosel (NMFS/SEFSC)**, **A.A. Hohn (NMFS/SEFSC)**, and **L.H. Schwacke (NOS)**



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

- The authors develop algorithms that worked very well at classifying dolphins according to the contaminant load accumulated in their blubber
- These results suggest that gene expression profile analysis can provide a cost-effective means to screen for indicators of chemical and biological toxin exposure, as well as disease status in dolphins and potentially other cetaceans

As top-level predators, common bottlenose dolphins (*Tursiops truncatus*) are particularly sensitive to chemical and biological contaminants that accumulate and biomagnify in the marine food chain. This work investigates the potential use of microarray technology and gene expression profile analysis to screen common bottlenose dolphins for exposure to environmental contaminants through the immunological and/or endocrine perturbations associated with these agents. A dolphin microarray representing 24,418 unigene sequences was used to analyze blood samples collected from 47 dolphins during capture-release health assessments from five different US coastal locations (Beaufort, NC, Sarasota Bay, FL, Saint Joseph Bay, FL, Sapelo Island, GA and Brunswick, GA). Organohalogen contaminants including pesticides, polychlorinated biphenyl congeners (PCBs) and polybrominated diphenyl ether congeners were determined in blubber biopsy samples from the same animals. A subset of samples ($n = 10$, males; $n = 8$, females) with the highest and the lowest measured values of PCBs in their blubber was used as strata to determine the differential gene expression of the exposure extremes through machine learning classification algorithms. A set of genes associated primarily with nuclear and DNA stability, cell division and apoptosis regulation, intra- and extra-cellular traffic, and immune response activation was selected by the algorithm for identifying the two exposure extremes. In order to test the hypothesis that these gene expression patterns reflect PCB exposure, we next investigated the blood transcriptomes of the remaining dolphin samples using machine-learning approaches, including K-nn and Support Vector Machines classifiers. Using the derived gene sets, the algorithms worked very well (100% success rate) at classifying dolphins according to the contaminant load accumulated in their





NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

blubber. These results suggest that gene expression profile analysis may provide a valuable means to screen for indicators of chemical exposure.

Expected Publication Date: TBD

Recommendations for photo-identification methods used in capture-recapture models with cetaceans

Marine Mammal Science

K. Urian, A. Gorgone, B. Balmer, P. Berggren, **J. Durban**, **T. Eguchi**, W. Rayment, and P. Hammond (NMFS/SWFSC)

- Photographic capture-recapture methods are widely used to estimate cetacean abundance.
- This study highlights the potential impact on abundance estimates of choices regarding the selection and manipulation of images in photographic mark-recapture.
- The authors provide recommendations for best practices for using natural markings in a capture-recapture framework that have wide applicability to the scientific community.

Capture-recapture methods are frequently employed to estimate abundance of cetaceans using photographic techniques and a variety of statistical models. However, there are many unresolved issues regarding the selection and manipulation of images that can potentially impose bias on resulting estimates. To examine the potential impact of these issues we circulated a test data set of dorsal fin images from bottlenose dolphins to several independent research groups. Photo-identification methods were generally similar, but the selection, scoring, and matching of images varied greatly amongst groups. Based on these results we make the following recommendations. Researchers should: (1) determine the degree of marking, or level of distinctiveness, and use images of sufficient quality to recognize animals of that level of distinctiveness; (2) ensure that markings are sufficiently



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT APRIL 14, 2014

distinct to eliminate the potential for “twins” to occur; (3) stratify data sets by distinctiveness and generate a series of abundance estimates to investigate the influence of including animals of varying degrees of markings; and (4) strive to examine and incorporate variability among analysts into capture-recapture estimation. In this paper we summarize these potential sources of bias and provide recommendations for best practices for using natural markings in a capture-recapture framework.

Expected Publication Date: Summer 2014

Spatio-temporal associations of albacore CPUE in the Northeastern Pacific with localized and climate environmental indices

ICES Journal of Marine Science

A.J. Phillips, L. Ciannelli, W. G. Pearcy, **R. D. Brodeur (NMFS/NWFSC)** and **J. Childers (NMFS/SWFSC)**

- Albacore catches have varied over a 48 year period in relation to changes in SST distribution and catch showed a threshold change around 1986.

We analyzed the spatial distribution of juvenile North Pacific albacore (*Thunnus alalunga*) in relation to local environmental variability (i.e., sea surface temperature (SST)), and two large scale indices of climate variability, the (Pacific Decadal Oscillation (PDO) and the Multivariate El Niño/Southern Oscillation Index (MEI)). Changes in local and climate variables were correlated to 48 years of albacore troll catch per unit effort (CPUE) at 1° latitude/longitude cells, using Generalized Additive Mixed Models (GAMM). Model terms were included to account for nonstationary and spatially variable effects of the intervening covariates on albacore CPUE. Results indicate that albacore CPUE rates increased with SST both before and after the 1976-77 regime shift of the North Pacific, but CPUE geographically contracted to the north after 1977. SST had a predominantly positive and spatially-variable effect on albacore CPUE, with increasingly positive effects to the North,



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

while PDO had an overall negative effect. Thus, albacore catches shift northward and shoreward as PDO and SST increase. These results imply that if ocean temperatures continue to increase, west coast fisher communities reliant on commercial albacore fisheries are likely to be negatively impacted in the southern areas but positively benefited in the northern areas, where current albacore landings are highest.

Expected Publication Date: Spring 2014

Mysterious bio-duck sound attributed to the Antarctic minke whale (Balaenoptera bonaerensis)

Biology Letters

D. Risch (NMFS/NEFSC), N. J. Gales, **J. Gedamke (NMFS/OST)**, L. Kindermann, D. P. Nowacek, A. J. Read, U. Siebert, I. C. Van Opzeeland, **S. M. Van Parijs (NMFS/NEFSC)**, and A. S. Friedlaender

- This mysterious bio-duck sound is pervasive throughout the southern hemisphere and has long thought to be man-made, with significant speculation about the source.
- This paper provides clear links between the minke whale and the sound, and opens up large acoustic data sets for analysis in relation to minke whale occurrence and distribution.

For decades, the bio-duck sound has been recorded in the Southern Ocean, but the animal producing it has remained a mystery. Heard mainly during austral winter in the Southern Ocean, this ubiquitous sound has been recorded in Antarctic waters and concurrently off the Australian west coast. Here we present compelling evidence that the bio-duck sound is produced by Antarctic minke whales (*Balaenoptera bonaerensis*). We analyzed data from multi-sensor acoustic tags that included intense bio-duck sounds, as well as singular downsweeps that have previously been attributed to this species. This finding allows the interpretation of a wealth of long-term acoustic recordings for this previously acoustically



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

concealed species, which will improve our understanding of the distribution, abundance, and behavior of Antarctic minke whales. This is critical information for a species that inhabits a difficult to access sea-ice environment that is changing rapidly in some regions and is currently the subject of contentious lethal sampling efforts and ongoing international legal action.

Accepted: 26 March 2014

Hedonic pricing of Atlantic Cod: effects of size, freshness, and gear

Marine Resource Economics

Min-Yang Lee (NMFS/NFSC)

- NOAA NMFS reports were used to determine the effects of size, freshness, and fishing gear on the *ex-vessel* price of cod.
- Prices of Atlantic cod (*Gadus morhua*) were found to be sensitive to the size of the fish, the freshness of the fish, and the fishing gear used to catch the fish.
- The authors suggest that future work should build on these efforts to ensure appropriate factors are included in bioeconomic models.

Atlantic cod (*Gadus morhua*) has been culturally and economically important in the northeast United States for hundreds of years. This research estimates a hedonic model of cod prices in the Northeast United States from 2005-2011. Data from the National Marine Fisheries Service's dealer and vessel trip report systems are combined in order to examine the effects of size, freshness, and fishing gear on the *ex-vessel* price of cod. While large cod typically receive premium prices due to higher meat yields, the largest cod receive prices that are approximately \$0.20 per pound lower than fish in the next largest market category. A moderate premium for freshness is found: cod caught on trips that last four days receive \$0.04 less per pound than fish that is caught on short trips. This discount rises to nearly \$0.15 per pound for trips lasting ten days or longer. A similar discount also



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

exists for fish that are stored for two or more days after landing. Bioeconomic models frequently parameterize size-, gear-, or area-dependent prices using simple group means. The premia estimated by the hedonic price model are quite different from the group means premia, suggesting that bioeconomic models that incorporate price heterogeneity may need to consider more sophisticated price models if there are many characteristics that could influence prices.

Expected Publication Date: September 2014

Dynamics of larval fish assemblages in the California Current System: a comparative study between Oregon and southern California

Marine Ecology Progress Series

A.R. Thompson (NMFS/SWFSC), T.D. Auth (NMFS/NWFSC), R.D. Brodeur (NMFS/NWFSC), N.M. Bowlin (NMFS/SWFSC), and W. Watson (NMFS/SWFSC)

- Fish abundances do not fluctuate coherently in Oregon and California and this implies that although both locations are in the California Current Ecosystem, they cannot be managed as a cohesive unit in an ecosystem-based management (EBM) context.
- This research has important implications for EBM and the California Current Integrated Ecosystem Assessment and provides guidance for future research that is necessary to quantitatively define spatial units for EBM.

Boundary currents influence near-shore ecosystems worldwide, and understanding how fish assemblages change spatially and temporally throughout these systems is important for establishing the scale at which ecosystem based management (EBM) should be conducted. Because most research on boundary currents in general, and the California Current System (CCS) in particular, have been restricted to only small portions of the systems, it is largely unknown whether fish assemblages in boundary currents form one coherent ecosystem or if changes in assemblage structure are locally independent. We





NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

expand the geographic scope of previous analyses on ichthyoplankton assemblages within boundary currents by comparing dynamics in two widely separated regions of the CCS: Oregon (~45°N) and southern California (~34°N) in spring and summer from 2004- 2011. Both region and season affected assemblage structure. Some taxa that were moderately common in California were consistently rare or absent in Oregon (and vice versa), and the presence of most decreased in summer in both regions. However, the assemblages were very similar in some years. Off Oregon the assemblage most resembled California's when the ocean temperature was relatively high and northern anchovy (*Engraulis mordax*) was abundant. Assemblage dynamics were well explained by environmental change in Oregon. By contrast, California's assemblage and environmental variability correlated poorly. Population sizes of taxa common to both regions did not fluctuate coherently in Oregon and California. These findings are important for EBM because they indicate that it is not possible to extrapolate results from spatially restricted localities to understand assemblage dynamics throughout the entire CCS.

Expected Publication Date: 30 June 2014

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

Progress and challenges in biogeochemical modeling of the Pacific Arctic region

The Pacific Arctic Region: Ecosystem Status and Trends in a Rapidly Changing Environment

C. J. Dean, N. Steiner, J. Christian, J. Kinney, K. Denman, S. Elliot, G. Gibson, M. Jin, D. Lavoie, S. Lee, W. Lee, W. Maslowski, **J. Wang (OAR/GLERL)**, and E. Watanabe

- Biogeochemical modeling in PAR has advanced significantly over recent years, but limitations still exist.
- The authors expect integrated observing and modeling approaches for PAR to



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT

APRIL 14, 2014

increase over the coming years, advancing our understanding of the underlying systems and our ability to accurately represent those systems in model equations. At this early stage of modeling marine ecosystems and biogeochemical cycles in the Pacific Arctic Region (PAR), numerous challenges lie ahead. Observational data used for model development and validation remain sparse, especially across seasons and under a variety of environmental conditions. Field data are becoming more available, but at the same time PAR is rapidly changing. Biogeochemical models can provide the means to capture some of these changes. This study introduces and synthesizes ecosystem modelling in PAR by discussing differences in complexity and application of one-dimensional, regional, and global earth system models. Topics include the general structure of ecosystem models and specifics of the combined benthic, pelagic, and ice PAR ecosystems, the importance of model validation, model responses to climate influences (e.g. diminishing sea ice, ocean acidification), and the impacts of circulation and stratification changes on PAR ecosystems and biogeochemical cycling. Examples of modeling studies that help place the region within the context of the Pan-Arctic System are also discussed. The authors synthesize past and ongoing PAR biogeochemical modelling efforts and briefly touch on decision makers' use of ecosystem models and on necessary future developments.

Expected Publication Date: 31 May 2014

Abrupt climate changes and emerging ice-ocean processes in the Pacific Arctic Region
The Pacific Arctic Region: Ecosystem Status and Trends in a Rapidly Changing Environment

J. Wang (OAR/GLERL), H. Eicken, Y. Yu, X. Bai, J. Zhang, H. Hu, D.R. Wang, K. Mizobata, and J. Overland

- Discussion of emerging physical ice-ocean processes and mechanisms associated





NOAA SCIENTIFIC PUBLICATIONS REPORT APRIL 14, 2014

with the unprecedented sea ice retreat in the Pacific Arctic region

- A series of new challenging questions is proposed

The authors reveal several emerging physical ice-ocean processes associated with the unprecedented sea ice retreat in the Pacific Arctic region (PAR). These processes are closely interconnected under the scenario of diminishing sea ice, resulting in many detectable changes from physical environment to ecosystems. Some of these changes are unprecedented and have drawn the attention of both scientific and societal communities. More importantly, some mechanisms responsible for the diminishing sea ice cannot be explained by the leading Arctic Oscillation (AO), which has been used to interpret most of the changes in the Arctic for the last several decades. The new challenging questions they pose are: (1) What is the major forcing? (2) Is the AO, the DA, or their combination, contributing to the sea ice minima in recent years? How do we use models to investigate the recent changes in the PAR. Is the heat transport through the Bering Strait associated with the DA? What processes accelerate sea ice melting in the PAR?

Expected Publication Date: 31 May 2014

United Nations Scientific Committee on the Effects of Atomic Radiation UNSCEAR 2013 Report to the General Assembly, with scientific annexes Volume I: Report to the General Assembly, Scientific Annex A

The UNSCEAR Committee, plus about 50 others including **Roland Draxler (OAR/ARL)**

- UNSCEAR's main conclusion was that for the great majority of people in Japan, the additional radiation doses received in the first year following the radioactive releases from the accident at FDNPS were less than the background doses received each year from natural sources of radiation (about 2.1 mSv).
- This is particularly the case for people living in prefectures remote from Fukushima Prefecture where doses of 0.2 mSv or less were estimated to have been received.



Southwest Fisheries Science Center, NOAA Fisheries Service



NOAA SCIENTIFIC PUBLICATIONS REPORT APRIL 14, 2014

- Based on an analysis of doses reported for countries neighboring Japan and for the rest of the world, UNSCEAR concluded that the total effective doses to individuals in populations living outside of Japan were less than 0.01 mSv in the first year following the accident.

On April 3, 2014, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) issued its report on the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident. Roland Draxler from NOAA's Air Resources Laboratory was one of 80 international scientists that contributed to the report. NOAA's contribution consisted of providing calculations of air concentration and deposition that was used by other experts to estimate radiation doses. The NOAA calculations, as well as those from other countries, are available on ARL's web page http://ready.arl.noaa.gov/READY_fdnppwmo.php. The NOAA dispersion model, HYSPLIT, and meteorological data from NCEP were extensively used in the Committee's evaluation. The NOAA acronym appears over 50 times in Annex A.

Published: 3 April 2014

Website: http://www.unscear.org/unscear/en/publications/2013_1.html

